

## 2.1 Soils Texture and Group Determinations

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### 2.1.1 Determining Soil Textural Classifications

Soil texture is determined by the proportion of three separates: sand, silt, and clay. It is one of the most important characteristics of soil for water movement because of its relationship to ~~pore size,~~ pore size distribution, and pore continuity. Permeability, aeration, and drainage are all related to the soils' ability to filter and adsorb ~~or otherwise retain,~~ pollutants ~~for treatment.~~ Sizes of the major separates are shown in Table 2-1.

**Table Error! No text of specified style in document.-1. Sizes of mineral, soil, and rock fragments.**

Material	Equivalent Diameter <sup>a</sup>	Passes Sieve #
Clay	<0.002 mm <sup>b</sup>	425
Silt	0.002–0.05 mm	270
Very fine sand	0.05–0.10 mm	140
Fine sand	0.10–0.25 mm	100
Medium sand	0.25–0.50 mm	50
Coarse sand	0.50–1.00 mm	16
Very coarse sand	1.00–2.00 mm	10
Gravel	2.00 mm–7.5 <del>mm</del>	3 in. <sup>b</sup>
Cobbles	7.5–250.4 <del>mm</del>	10 in.
Stones	250.4 –6004 <del>mm</del>	24 in.
Boulders	>6004 <del>mm</del>	—

a. NRCS National Soil Survey Handbook (NSSH) Part 618 (Subpart A), 618.46 (D) and 618.31(K) 3ii

b. ~~Notes:~~ millimeter (mm); ~~centimeter (cm);~~ inches (in)

The Soil Textural Classification used by Idaho was adopted from the United States Department of Agriculture (USDA). Soil textures of proposed soil absorption sites are determined according to these guidelines. Once the textures have been determined, then the soil design groups may be specified for the absorption system design. Characteristics of each soil texture are shown in Table 2-2. To determine the texture classification of soils, refer to Table 2-~~32~~, ~~Table 2-3~~, and Figure 2-1 for summaries of the soil particle distributions and percentages in each of the textures. Refer to Figure 2-2 for a flowchart of the steps for determining soil classification.

**Table 2-2. Soil textural characteristics<sup>a</sup>.**

<b>Soil Texture</b>	<b>Visual Detection of Particle Size and General Appearance of Soil</b>	<b>Squeezed by Hand and Pressure Released When Air-Dry</b>	<b>Squeezed by Hand and Pressure Released When Moist</b>	<b>Ribbon Between Thumb and Finger</b>
Sand	Soil has a granular appearance, loose, gritty grains visible to the eye. Free flowing when dry.	Will not form a cast. Falls apart easily.	Forms cast that crumbles at least touch.	Cannot ribbon
Sandy loam	Somewhat cohesive soil; aggregates easily crushed. Sand dominates but slight velvety feel.	Cast crumbles easily when touched.	Cast will bear careful handling.	Cannot ribbon
Loam	Uniform mixture of silt, clay, and sand. Aggregates crushed under moderate pressure. Velvety feel that becomes gritty with continued rubbing.	Cast will bear careful handling.	Cast can be handled freely.	Cannot ribbon
Silt loam	Quite cloddy when dry. Can be pulverized easily to a fine powder. Over 50% silt.	Cast can be freely handled. Flour-like feel when rubbed.	Cast can be freely handled. When wet, flows into puddle.	Will not ribbon but has slight plastic look.
Silt	Over 80% silt with little fine sand and clay. Cloddy when dry pulverizes readily to a flour-like powder.	Cast can be freely handled.	Cast can be freely handled. Puddles readily. "Slick" feeling.	Ribbons with a broken appearance.
Silty clay loam	Hard lumps when dry, resembling clay. Takes strong pressure to break the lumps.	Cast can be freely handled.	Cast can be freely handled. Can be worked into a dense mass.	Forms thin ribbon that breaks easily.
Clay	Very fine textured soil breaks into very hard lumps that take extreme pressure to break.	Cast can be freely handled.	Cast can be freely handled. "Sticky" feeling.	Forms long, thin ribbons.

<u>Soil Texture</u>	<u>USDA Soil Textural Classification</u>	<u>Dry Soil Description (0-25% available moisture percent<sup>b</sup>)</u>	<u>Moist Soil Description (75-100% available moisture percent)</u>	
			<u>Ball<sup>c</sup> Formation</u>	<u>Ribbon<sup>d</sup> Between Thumb and Finger</u>
<u>Coarse</u>	<u>Fine sand</u>	<u>Dry, loose, will hold together if not disturbed, loose sand grains on fingers with applied pressure</u>	<u>Wet, forms a weak ball<sup>†</sup>, loose and aggregated sand grains remain on fingers, darkened color, heavy water staining on fingers</u>	<u>Will not ribbon</u>
	<u>Loamy fine sand</u>			
	<u>Sand</u>			
	<u>Coarse sand</u>			
	<u>Loamy coarse sand</u>			
<u>Moderately Coarse</u>	<u>Loamy sand</u>	<u>Dry, forms a very weak ball, aggregated soil grains break away easily from ball</u>	<u>Wet, forms a ball with wet outline left on hand, light to medium water staining on fingers</u>	<u>Makes a weak ribbon between thumb and forefinger</u>
	<u>Very fine sand</u>			
	<u>Sandy loam</u>			
	<u>Fine sandy loam</u>			
	<u>Very fine sandy loam</u>			
<u>Medium</u>	<u>Coarse sandy loam</u>	<u>Dry, soil aggregations break easily, no moisture staining on fingers, clods crumble with applied pressure</u>	<u>Wet, forms a ball with well-defined finger marks, light to heavy soil/water coating on fingers</u>	<u>Ribbons between thumb and forefinger</u>
	<u>Loamy very fine sand</u>			
	<u>Sandy clay loam</u>			
	<u>Loam</u>			
<u>Fine</u>	<u>Silt loam</u>	<u>Dry, soil aggregations easily separate, clods are hard to crumble with applied pressure</u>	<u>Wet, forms a ball, uneven medium to heavy soil/water coating on fingers</u>	<u>Ribbons easily between thumb and forefinger</u>
	<u>Silt</u>			
	<u>Clay</u>			
	<u>Clay loam</u>			
	<u>Silty clay loam</u>			
	<u>Sandy clay</u>			
	<u>Silty clay</u>			

- a. Adapted from USDA Natural Resource Conservation Service (NRCS). April 1998, Reprinted June 2005. Estimating Soil Moisture by Feel and Appearance. Program Aid Number 1619.
- b. Available moisture percent is that percent of the available water-holding capacity of the soil occupied by water.
- c. Ball is formed by squeezing a hand full of soil very firmly with one hand.
- d. Ribbon is formed when soil is squeezed out of hand between thumb and forefinger.

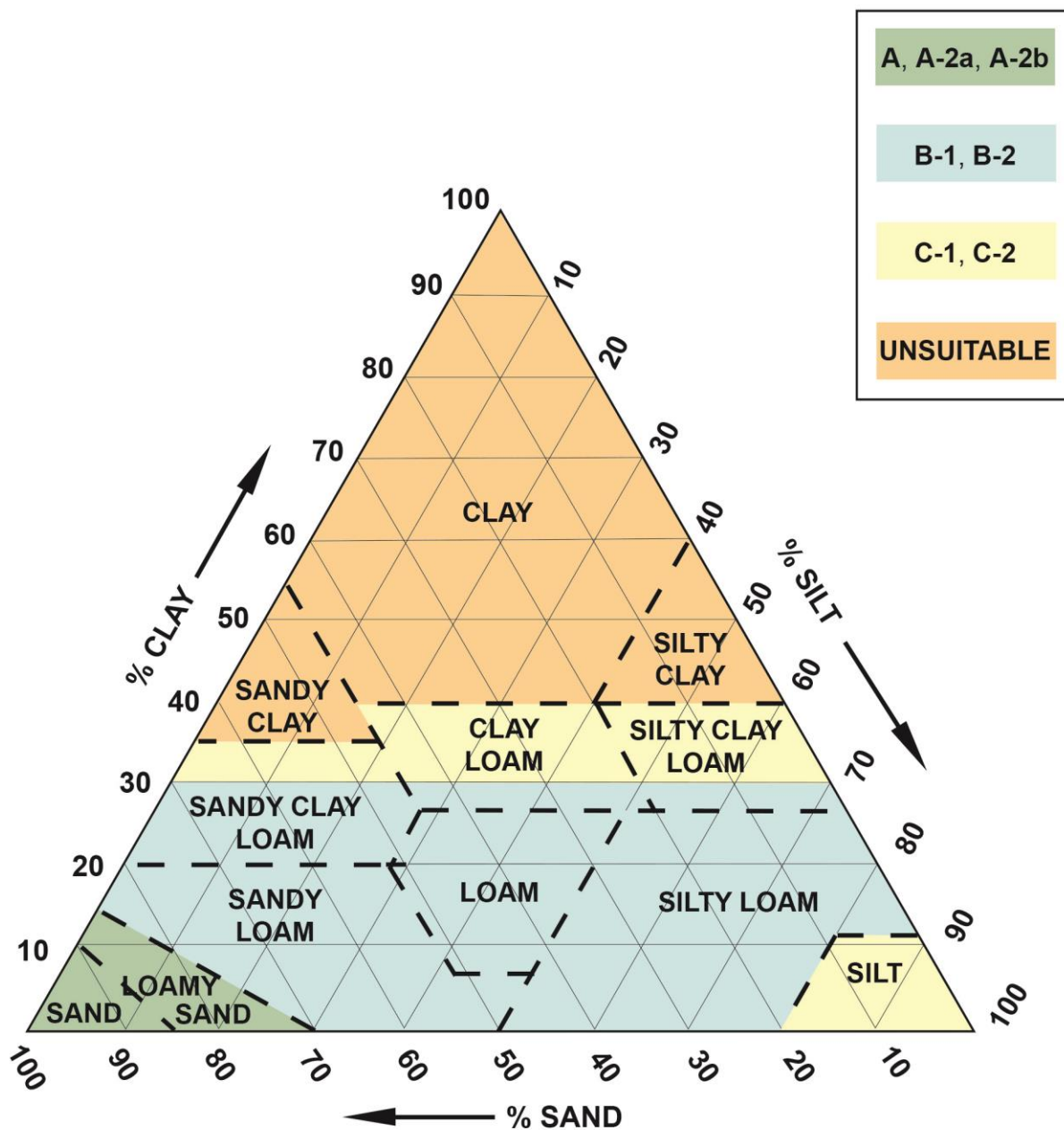
**Table 2-3. Soil textural proportions.**

<b><u>USDA Soil Textural Classifications</u></b>	<b>Sand (%)</b>	<b>Silt (%)</b>	<b>Clay (%)</b>
Sand	>85	<15	<10
Loamy sand	70–90	<30	<del>4</del> 0–15
Sandy loam	43–85	<50	<20
Loam	23–52	<del>28</del> –<50	7–27
Silty loam	<50	50–88	<27
Silt	<20	>80	<12
Sandy clay loam	45–80	<28	20–35
Clay loam	20–45	15–53	27–40
Silty clay loam	<20	<del>64</del> 0–73	27–40
Sandy clay	45–65	<20	35–55
Silty clay	<20	40–60	40–60
Clay	<45	<40	>40

Basic textural names may be modified if the soil mass contains 15%–95% of stones, cobble, or gravel by adding the name of the dominant rock fragment:

- Gravelly or stony = 15%–35% of the soils volume is rock fragments.
- Very gravelly or very stony = 35%–60% of the soils volume is rock fragments.
- Extremely gravelly or extremely stony = 60%–95% of the soils volume is rock fragments.
- 95% or more should take the name of the geological type, such as granite, gneiss, limestone, or gravel.

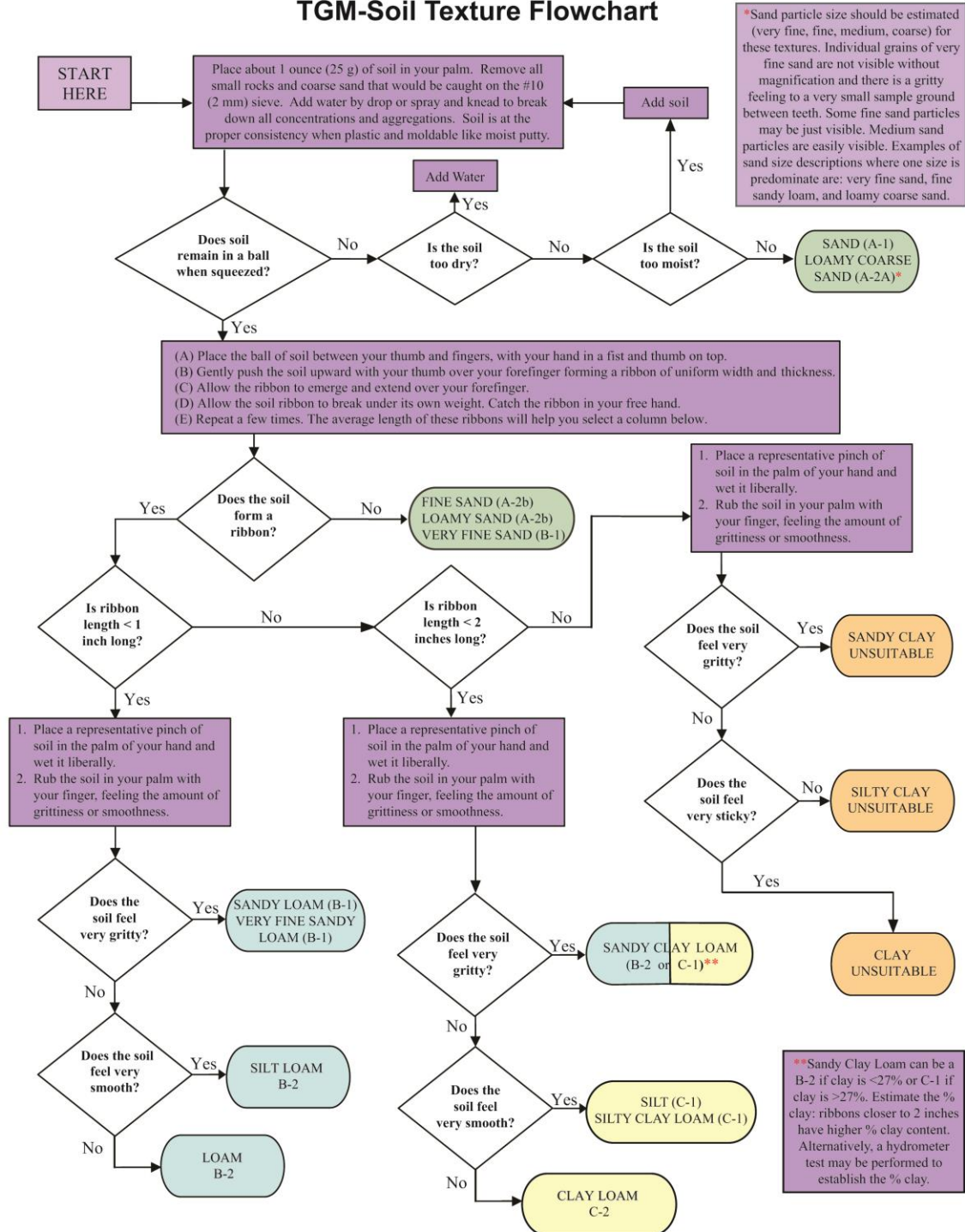
## TGM-Soil Texture Flowchart Triangle



A black and white version is provided in Appendix B.

Figure 2-1. United States Department of Agriculture soil textural triangle.

## TGM-Soil Texture Flowchart



A black and white version is provided in Appendix B.

**Figure 2-2. Soil texture determination flowchart.**

## 2.1.2 Soil Design Groups and Subgroups

This section is provided as a guide to field environmental health personnel in making technical allowances for standard systems and for health districts to use in selecting alternative systems. The required absorption area of a subsurface sewage disposal system depends on the texture of the soils in the proposed disposal system location. In a similar manner, required separation distances between the disposal area and features of concern, such as wells, surface water, and ground water, depend on soil texture. Soils surrounding the disposal system and those below it may not be the same.

The soil design group or subgroup (Table 2-4) used to determine the minimum effective soil depth, and applicable separation distances, describes the finest-textured soils adjacent to the drainfield trenches and beneath the drainfield for the effective soil depth.

All other soil textures and some soil features (i.e., gravel, coarse sand, all clays, organic muck, claypan, hardpan, and duripan) are unsuitable for installing a standard drainfield system.

**Table 2-4. Soil textural classification design groups.**

Soil Design	Soil Design	Soil Textural Classification	Application Rate <sup>a</sup> (GPD/ft <sup>2</sup> ) <sup>b</sup>
<u>NS<sup>c</sup></u>	<u>NS</u>	<u>Gravel</u> <u>Coarse sand</u>	<u>NS</u>
A	A-1	<del>Medium sand</del> <sup>d</sup>	<u>1.2</u>
	A-2a	<del>Medium</del> <u>Loamy coarse</u> sand	<u>1.0</u>
	A-2b	Fine sand Loamy sand	<u>0.75</u>
B	B-1	Very fine sand Sandy loam Very fine sandy loam	<u>0.6</u>
		Loam	
		Silt loam	
	B-2	Sandy clay loam ( <u>≤27% clay</u> )	<u>0.45</u>
C	C-1	Silt Sandy clay <u>loam<sup>e</sup></u> Silty clay loam <sup>e</sup>	<u>0.3</u>
		Clay loam <sup>e</sup>	
	C-2	Clay loam <sup>e</sup>	<u>0.2</u>
<u>NS</u>	<u>NS</u>	<u>Sandy Clay</u> <u>Silty Clay</u> <u>Clay</u> <u>Organic muck</u> <u>Duripan</u> <u>Hardpan</u> <u>Claypan</u>	<u>NS</u>

a. Application rates are for domestic strength wastewater. A safety factor of 1.5 or more should be used for wastes of significantly different characteristics.

b. Gallons per day per square foot (GPD/ft<sup>2</sup>).

- c. Not suitable (NS) for installation of a subsurface sewage disposal system.
- d. See medium sand definition (section 3.2.8.1.2) for a manufactured material that may be acceptable for use.
- e. Soils without expandable clays.

### 2.1.3 Soil Design Subgroup Corrections

A soil design subgroup may be lowered as indicated in this section. **(Subgroup correction is used to determine the application rate only; it will not change surface water or ground water separation requirements.)**

1. Soil with moderate or strong platy structure should be lowered one subgroup for design purposes.
2. Soil should be lowered one subgroup if 35%–60% of its volume is rock fragments (very gravelly, very stony).
3. Soil should be lowered by two subgroups if 60%–95% of its volume is rock fragments (extremely gravelly, extremely stony).
4. Soil with 95% or greater rock fragments is unsuitable as an effective soil for subsurface sewage disposal.
5. Uniform fine and very fine sand (e.g., blow sands) should be lowered two subgroups for design purposes. Soils that qualify for this modification have a coefficient of uniformity less than three ( $C_u < 3.0$ ).

#### Example:

A soil evaluation results in the designation of loamy sand with rock fragments volumes estimated at 70% of the total soil volume ~~below~~ within the effective soil depth ~~of below~~ the drainfield installation. The loamy sand would be assigned a soil design subgroup of A-2b consistent with Table 2-4. Due to the estimated volume of rock fragments, the soil design subgroup would then be lowered by two subgroups resulting in an assigned soil design subgroup of B-2. Based on these determinations, the drainfield would be sized consistent with the B-2 soil application rate (0.45 GPD/ft<sup>2</sup>; ~~section 2.3~~, Table 2-~~94~~) to increase the available soil surface available for effluent treatment due to the soil surface being reduced by large fraction rock. However, both the required vertical (effective soil depth, IDAPA 58.01.03.008.02.c) and the horizontal separation distances (IDAPA 58.01.03.008.02.d) shall meet the requirements for soil design group A soils.